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FOSSILS FROM ORANGE GROVE: A LOCAL PUZZLE SOLVED

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INTRODUCTION

In the late 1950s, reports began circulating in Perth's natural history circles of the presence of apparent fossil shells and corals, associated with Aboriginal stone artefacts, in an area of wind-eroded dunes at the foot of the Darling Scarp at Orange Grove, 16km south-east from Perth. Subsequent visits to the locality, along the north-eastern side of White Road, beginning around 1960 and continuing sporadically through to 1987, resulted in several collections of this material being deposited in the Western Australian Museum.

Over the years, a shallow sandpit had developed gradually on part of the site, with the removal of much of the top soil and exposure of shells and corals on deflated surfaces of disturbed ground. Early conjecture (e.g. Butler 1958) centred on the possibility of its being an emergent Quaternary shore deposit but further examination led to strong reservations about any such explanation. The fossil material appeared to have been dispersed widely over a substantial area of sandy ground but no convincing *in situ* occurrence of shells or corals was ever recognized.

Childhood recollections from the 1920s and 1940s, of people having close family connections with the locality, persisted with stories of significant quantities of shells being gathered and dug out of the dunes but without any corresponding awareness of how these had come to be there. No relevant knowledge of dumping of extraneous material on the site was ever forthcoming.

Contoured lithographic maps of the area show that the original elevation of the land along the north eastern side of White Road (Canning Locations 50, 84 and 155) was close to 40m above Australian Height Datum (equivalent to mean sea level). This is considerably higher than any known emergent Quaternary marine formation from the Swan Coastal Plain (Fairbridge 1954). As geological features, the Orange Grove dunes along White Road and others occurring in similar situations to north and south may be shore-line deposits associated with marine beds of the Pliocene Ascot Formation (Playford *et al.* 1976: 205), which underlie at shallow depth the surface sands and clays of the Swan Coastal Plain to within a few km west of White Road (W.A. Museum unpublished data). Shells and corals from White Road have almost nothing in common with those from the Ascot Formation and little more with those of the younger Quaternary assemblages of the district, as the following tabulation shows.

Table 1: Species of molluscs and corals from deflated sand surfaces along White Road, Orange Grove represented in the fossil collection of the Western Australian Museum to 1987. Distributional data from the Museum's modern and fossil collections except where indicated otherwise.

Species	No. specimens	Distributions	
		Living	Fossil
(a) Bivalve molluscs			
1. *Megacardita incrassata* (Sowerby)	1	Recherche Archipelago to Shark Bay	Quaternary of Swan Coastal Plain
2. *Fragum (Fragum) unedo* (Linnaeus)	15	Indo-SW Pacific, S to Shark Bay (Wilson and Stevenson 1977)	Quaternary within the living range (W.A.)
3. *Fragum (Fragum) carinatum* (Lynge)	1	South China Sea (Lynge 1909) unknown Australian seas	Pleistocene, Pilbara to Swan Coastal Plain
4. *Fragum (Lunulicardia) hemicardium* (Linnaeus)	11	Indo-SW Pacific S to Shark Bay (Wilson and Stevenson 1977)	Quaternary within the living range (W.A.)
5. *Callista impar* (Lamarck)	1	NW Australia S to Shark Bay	Quaternary within the living range
6. *Gafrarium intermedium* (Reeve)	1	NW Australia S to Shark Bay	Quaternary within the living range
7. *Circe sulcata* Gray	3	Indo-SW Pacific S to Albany	Quaternary of Shark Bay, Esperance (W.A.)
8. *Anomalocardia (Anomalodiscus) squamosa* (Linnaeus)	3	NW Australia S to Shark Bay	Quaternary of Shark Bay and Kalbarri; Holocene of Hutt Lagoon, Fremantle (W.A.)
9. *Placamen berryi* (Gray in Wood)	5	NW Australia S to Shark Bay	Quaternary of Shark Bay; Holocene of Hutt Lagoon
10. Bivalve fragments, undetermined	6	-	-
(b) Gastropod molluscs			
11. Thalotia *(Prothalotia)* sp. cf. *T. (P.) flindersi* (Fischer)	2	NW Australia S to Houtman Abrolhos	Quaternary of Shark Bay and Greenough River; Holocene of Swan Coastal Plain
12. *Turbo* sp.	1	?	?
13. Vermetidae, genus and species undetermined	4	?	?
14. *Clypeomorus* (?) sp. A corroded specimen possibly *C. bifasciata (Sowerby)*	1	*C. bifasciata* - NW Australia S to Houtman Abrolhos	*C. bifasciata* - Quaternary of Shark Bay; Holocene of Swan Coastal Plain
15. Naticidae, genus and species undetermined	1	?	?
16. *Thais orbita* (Gmelin)	1	Southern Australia N to North West Cape	Pliocene - Quaternary of Swan Coastal Plain

(C) Corals

17. *Acropora* sp. (All of staghorn type, species undetermined)	24	Genus throughout Indo-SW Pacific; in W.A., S to Houtman Abrolhos (common) and Jurien Bay (rare) (Veron and Marsh 1988)	Pleistocene of Rottnest (Playford 1988) and SW Australia
18. *Goniastrea or Favites* species undetermined	1	Species of both genera (tropical-subtropical) in W.A. S to Geographe Bay	Quaternary within the living range (genera)

The foregoing analysis shows that, of the 16 mollusc species recorded, five (*Fragum unedo, Fragum hemicardium, Callista impar, Gafrarium intermedium* and *Placamen berryi*) are of unqualified northern affinity, having no known natural occurrences, modern or fossil, within 500-800 km of the Swan River district. One other species, *Anomalocardia squamosa*, also of northern affinity, has a very limited presence in the district and reasonably could be added to the extra-limital group. These six species contribute 36 of the 57 mollusc specimens to hand (63%) and together with the 24 pieces of *Acropora* coral, suggest a source for most of the study material located well to the north of Perth. Their presence at Orange Grove seemed explicable only as a consequence of some unknown human acitivity.

As outlined above, the "Orange Grove puzzle" rested for some years until 1983-1987, when a convergence of interests concerning palaeontology (Dodds, Kendrick, Roe), local history (Lefevre) and colonial grain production and milling (Roe) brought the question back into focus. From this combined approach, an intriguing tale of local, colonial and natural history began to come together, leading eventually to an acceptable explanation.

JABEZ WHITE — A SETTLER EXTRAORDINARY

In 1842 Richard and Elizabeth White disembarked at the Swan River Settlement from the immigrant ship "Simon Taylor". A yeoman farmer, White initially leased land in the Canning district and subsequently he and son Jabez purchased land there, near Bibra Lake and at East Rockingham (Figure 1). In 1860, Jabez acquired Canning Location 50 (Figure 2) on Bickley Brook in what is now Orange Grove (Government Gazette, 17 July 1860; Erickson 1979: 894-6) to become a nucleus of his "Canning Dale" farm. Here, with wife Sarah, a home was built for a growing family, eventually to number six sons and five daughters. A vineyard and winery had been established by 1874 (McDonald and Cooper 1988: 101). In 1876, White was seeking Government survey of adjacent land, which he wished to acquire and fence; this became Location 84, purchased in 1880 and utilized for cropping and grazing. Location 155, also adjoining the original Location 50, was acquired in 1885.

In the 1860s jarrah logging and milling in the Darling Range behind Gosnells-Kelmscott was becoming an important, largely export-orientated industry. A prominent entrepreneur in this field was Benjamin Mason, who established several mills in the district, the first near the junction of Welshpool and Lesmurdie Roads (Hickson 1972, 1973), and subsequently at Mason's Landing on the Canning River and Carmel near the head of Bickley Brook (Carden 1968; Slee and Shaw 1979; Hickson and Slee 1983).

The industry employed many men and provided a ready market for surplus local farm produce (dairy, flour, fruit, vegetables, etc.) in which trade the Whites took a prominent part.

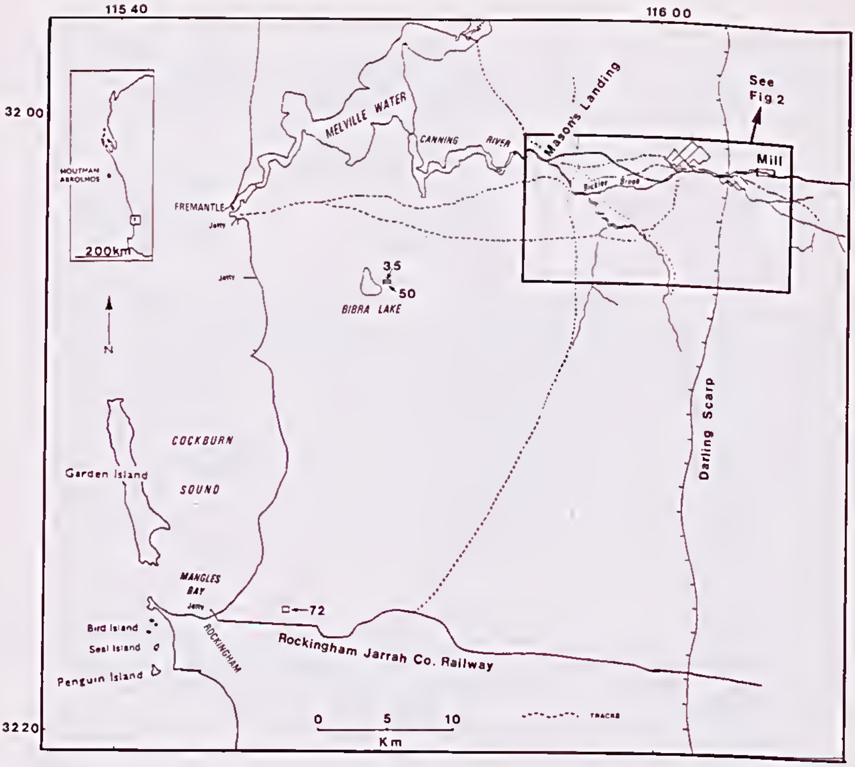

Figure 1. Map showing locations of places mentioned in text. Locations 35, 50 and 72 are Cockburn Sound Locations.

In 1865, Jabez White obtained a local timber licence, (Government Gazette, 6 June 1865) bringing him into closer association with Mason and also with the Bateman brothers of the Fremantle merchant company J. and W. Bateman, who had a "timber station" in the area (Inquirer, 9 August 1865; Perth Gazette and Inquirer, 1865-66). Rachel White, sister of Jabez, was married to John Bateman in 1850. The Batemans were to become prominent in the commercial life of the Colony (Twentieth Cent. Imp. 1901; Battye 1912; Hitchcock 1929) and their firm was a supplier of timber for Government construction projects (Government Gazettes, 1859-1868) as well as being active in general importing and exporting, whaling, pearling, the sandalwood and horse trades and lightering. The company enjoyed a monopoly of W.A. coastal shipping until the advent of steam. From 1864-1888, Batemans were involved with the guano trade, mainly from the Houtman Abrolhos, from where it was delivered to Fremantle, Rockingham, Bunbury and the Vasse. This commodity was of great importance to agriculture, because of the poor quality of most soils in the Colony, at a time prior to the development of superphosphate fertilizers.

Benjamin Mason's Carmel timbermill opened in 1864 and expanded greatly from 1871 when F. Bird joined the company, bringing capital for the construction of a horse-drawn tramway connecting the mill with Mason's Landing on the Canning River, opening to traffic in the following year.

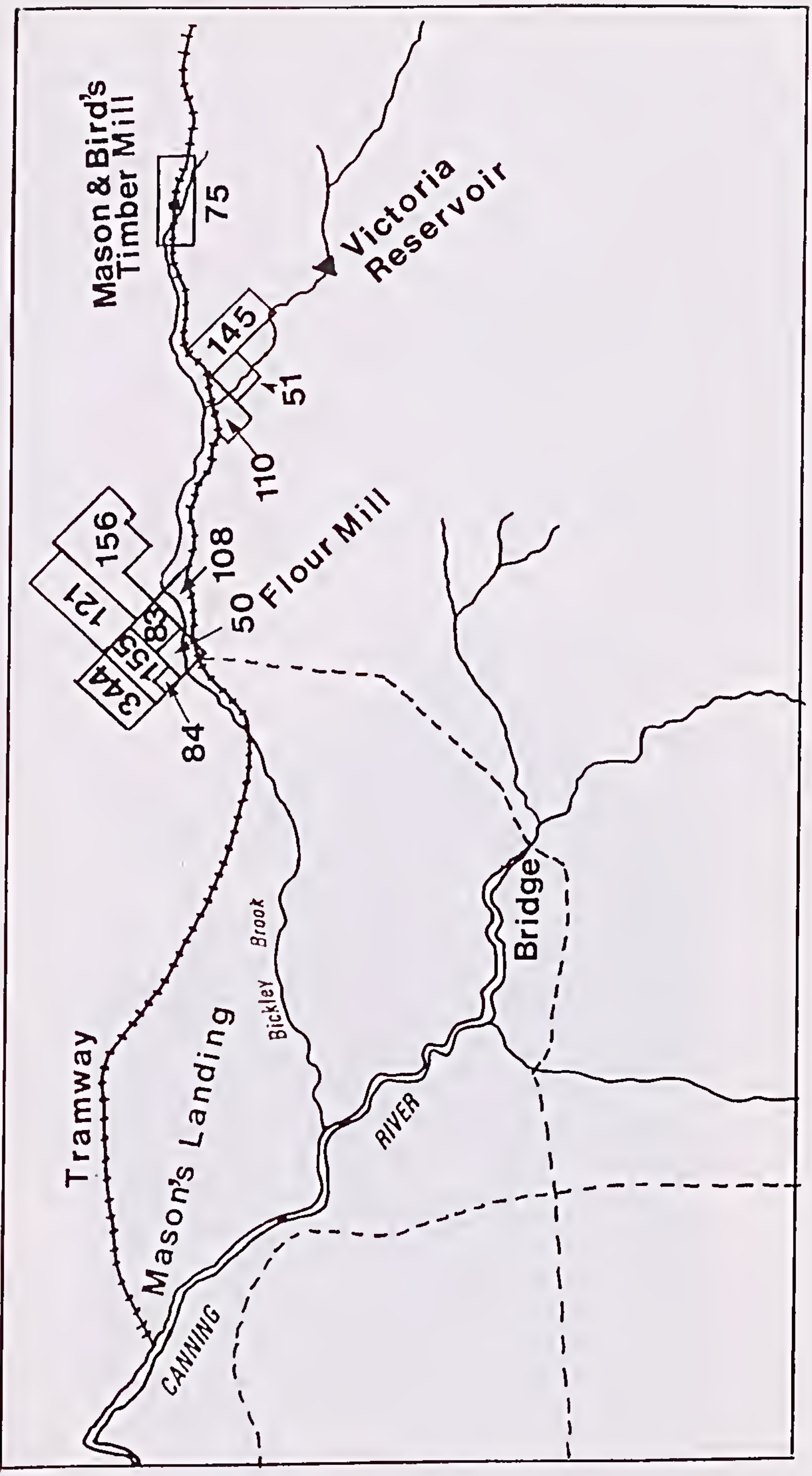

Figure 2. Map showing locations of Jabez White's properties in the Orange Grove area. Location numbers as Canning Location numbers.

Timber was lightered from there to Perth or Fremantle with much difficulty, due to the shallow nature of the Canning estuary. Today few relics remain of this once-prominent industry. Remains of the convict 'fence' in the Canning at Shelley, a navigation channel, date from this period. The original timber-trestle bridge that carried the tramway over Munday Brook still stands (thanks to restoration by the Gosnells City Council) and the present Hardinge Road and Mason and Bird Heritage Trail follow the tramway formation down to White Road at Orange Grove. A grave in the forest near Victoria Reservoir, the remains of Francis Weston, who died January 1876, aged 2 days, is a poignant reminder of the hardships and perils of pioneer life. Further details of the history of the Mason and Bird tramway are available in McNamara (1961), Carden (1968), Whiteford (1977), Slee and Shaw (1979) and Hickson and Slee (1983).

Jabez White's farm on Bickley Brook and his business and family connections saw him well-placed to take advantage of the burgeoning timber industry in the adjacent forest. The Canning Correspondent of the Perth Gazette, November 1877 noted "that energetic settler, Mr Jabez White, has completed his flour mill. It does its work well. He now finds the advantage of his large dam, he being able by means of a floodgate to irrigate many acres of his land. Thus not withstanding the dry season his wheat looks splendid".

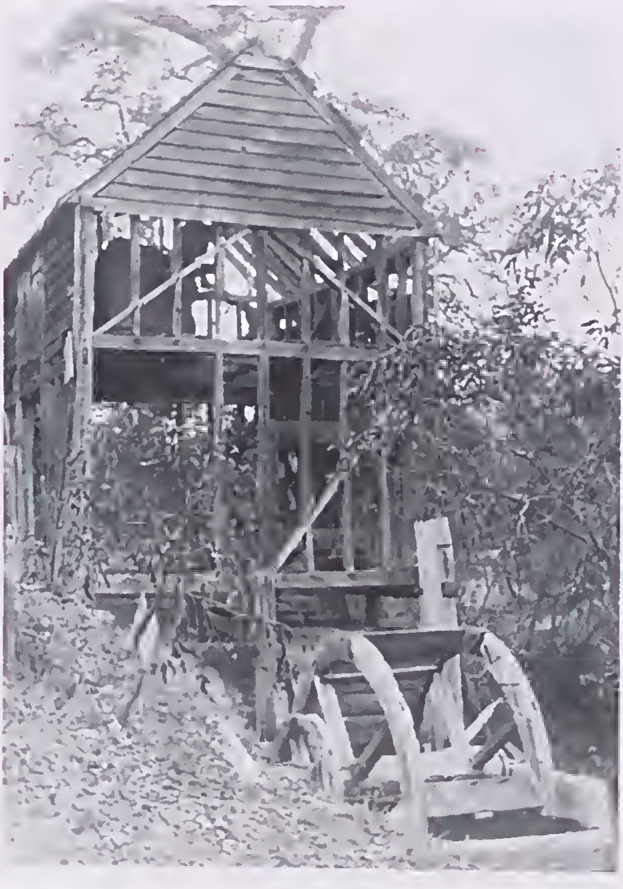

Figure 3. Jabez White's flourmill on Canning Location 50 built in 1877 and destroyed by fire in 1951. Photo taken in 1928/29 by Harriet White. Photo courtesy of Mr George White.

The Bickley Brook flour mill (Figure 3) was indeed a credit to Jabez White's energy and ingenuity. Family recollections recounted to us by grandson Mr George White reveal that among his grandfather's skills were those of carpenter and millwright. The mill was a two-storey jarrah weatherboard building on the right bank of Bickley Brook near its emergence from the Darling Scarp. The overshot wheel was seven to eight feet (2.1-2.4m) in diameter and some three to three and a half feet (0.9-1.1m) wide, all made of jarrah except the hub, which was wandoo. The water wheel turned a wooden pulley-wheel on one side. Leather belting about eight or nine inches (203-229mm) wide and very thick, of several layers, drove a second pulley wheel, from which a shaft connected to an iron crown-wheel and pinion under the millstones. The hopper directing wheat to the millstones, was on the upper floor, as was the inclined flour-dresser, which was driven by belting. Wooden stairs connected the floors. The millstones, of local granite, were 32 inches (81.3cm) in diameter and five to eight inches (127-203mm) deep and were cut by Jabez in the hills nearby. The mill was water powered and was served by a race fed from a dam on Bickley Brook.

Jabez White's mill operated for many years but the completion of Victoria Reservoir on Munday Brook in 1891 (Hunt 1980; Hunt 1985) reduced the water flow at the mill to such a degree as to prevent its successful working and it fell into disrepair. It could still be hand-operated and was used occasionally in later years to grind grain such as oats for cattle feed. Sadly, the structure was reduced to ashes in a bushfire in 1951; the millstones, which cracked in the fire, now rest in a garden at Kalamunda.

Many tales from "early days" in the area were recounted to George White by his (then elderly) uncles Jabez II and Harry White, who recalled Aboriginal people camping in the sand dunes north of the homestead. Several Aboriginal graves were known to occur in this area. Like all local residents, George White was well aware of the presence of fossil shells, etc on the sandy area along White Road but was unable to suggest how they had come to be there. Like others, he discounted their having been dumped or off-loaded from a vehicle, a view consistent with their scattered distribution.

Location 84, acquired in 1880, was used for cropping wheat and oats and also for grazing. George White recounted to us that (east) wind erosion began there in the 1920s along a cart track. A subsequent change of ownership and cultivation practice were associated with further deflation and by 1945 sand hummocks had formed over the one-time field surface. The drift sand was sold to level the surface and around this time, scattered fossil shells, etc became apparent. A small sand-pit developed in later years.

CLOSING THE CIRCLE

This advances our story to the year 1987. By that time, the authors had come to appreciate the great value of George White's knowledge of the locality, extending as it did across the generations back to the mid-decades of the last century. In a mood approaching desperation, it was resolved to attempt to excavate shells from relatively "undisturbed" ground in the Orange Groves dunes and submit these for radiocarbon age determination. It was felt that this would help toward explaining the anomalous character of the material and with this in mind, Mr White kindly agreed to meet us on site and indicate areas where he recalled, from his younger days, concentrations of shells. On 14 October 1987, this was done; however, before starting to dig, a conversation got underway within the group concerning the extremely poor quality of the soil for a crop such as wheat. Richer, heavier soils occur in the district and it seemed remarkable that Jabez White and his sons should have concentrated their wheat-growing on soils deficient in nutrients.

At that precise moment, Mr White recalled being told (in the 1920s) by his (then elderly) uncles Jabez II and Harry, of trips by horse and cart, back in the previous century, through the bush to Rockingham, then a port, to pick up loads of guano fertilizer, which was brought back to the farm, spread over the sandy wheat field and then ploughed in. From this tenuous, almost-faded recollection, suddenly, a plausible solution to the puzzle emerged. It seems to us highly probably, even certain, that the "fossils" came to Orange Grove, from Rockingham in guano sacks!

Subsequently, we have become aware of archives in the care of the Gosnells City Council, thought to have been complied by the late Mr Harold Walker, which record that "Jabez White drove his drays to Rockingham (the trip taking a week) to load bird droppings from Garden Island. He used this to fertilize land to grow wheat...". (Gosnells City Council files.)

Guano deposits on Western Australian islands were mined extensively from 1847-1910; initially most went abroad, but around 1876, local demand overtook exports (Wells 1955: 2). Guano fertilizer was expensive, considering the handling and transportation costs involved, and probably beyond the means of many small farmers. However, Jabez White, with his productive farm, his large family and a connection with a company involved in the guano trade, would not have been among the disadvantaged in that respect. Some enterprising farmers collected their own guano from islands near Warnbro Sound according to Chape (1984: 33) and the White family would have had the resources to undertake such activities.

The main sources for the guano trade were the Houtman Abrolhos and Lacepede Islands, with lesser contributions from Shark Bay, all located in subtropical waters to the north of the Swan River. Extraction techniques were basic; guano was chipped, scraped or dug from limestone surfaces and bagged. Some contamination from shells or coralline rubble would have been inevitable and it is this which provides the only plausible explanation for such anomalous material at Orange Grove. The species —distributional data presented above are fully consistent with such an origin.

The passage of time, and passing of generations, changes of ownership and farming practice, obsolescence, bushfires, soil erosion and on-going opportunities and imperatives of a changing economic and social order have combined to remove from view most of what was for a few decades (1860-1890) along Bickley Brook a thriving example of colonial, rural self-sufficiency. Among the few relics bequeathed to us from this other day and age is a small collection of "puzzling fossils" from Jabez White's "Canning Dale" farm.

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BIOLOGICAL NOTES ON *SCHOENUS CAPILLIFOLIUS* (CYPERACEAE) A RARE AND UNUSUAL SEDGE

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INTRODUCTION

Schoenus capillifolius D.A. Cooke is a semi-aquatic annual sedge and was described by Cooke (1981) from Ellen Brook, 13 km north of Midland. The species occupies an isolated position within the genus, and is probably a relict. Nothing has been published previously on the biology of the species, or for that matter on any Western Australian *Schoenus* species.

LOCALITIES

The species is currently known from three localities. The type locality, and a second population at Orange Grove. Both of these localities are empheral claypans within Metropolitan Perth. These wetlands were once common on the northern coastal plain, but have been largely cleared for farmland or more recently housing.

A third population was discovered on a railway verge at Waterloo (12 km N. of Bunbury) also on the coastal plain, and an ephemeral claypan.

All populations are located in remnant vegetation on the Swan Coastal Plain, over a geographical range of 150 kilometres.

Associated Species. Claypans where *Schoenus capillifolius* occurs are largely open with a spare cover of *Melaleuca laterita* and at Ellen Brook, an undescribed species of *Kunzea.* The open regions of the claypans contain a rich flora of native herbs, including *Hydatella dioica, Hydatella australis, Trithuria submersa, Brizula drummondii,* several *Centrolepis* species, *Pilularia novae-hollandiae, Eleocharis acuta, Eleocharis* sp. (GK 5179), *Isolepis* species, *Myriophyllum* species, *Aponogeton hexatepalus, Eryngium pinnatifidium* var. *subdecumbens, Eryngium pinnatifidium* ssp. nov. (GK6413), *Wurmbea* dioica — form, *Hydrocotyle lemnoides, Tribonanthes* aff. *australis* (GK6259).

Many of these herbs are unusual forms restricted to this habitat, and two are already gazetted as rare flora. Studies have and are being undertaken on the distribution and biology of this claypan flora to complement this paper.